MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2022/2023 (TERM ID 2210)

BPO2614 – PRODUCTION AND OPERATIONS MANAGEMENT

(All sections/Groups)

13 FEBRUARY 2023
9.00 A.M. – 12.00 P.M.
(3 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of **SEVEN (7)** pages (including the cover page).
2. Attempt **ALL** questions. The distribution of the marks for each question is given.
3. Please write all your answers in the Answer Booklet provided.

QUESTION 1

(a) Identify and explain the **FOUR (4)** global operations strategies (in terms of the degree of cost reduction and local responsiveness). Give an example for each strategy.
(12 marks)

(b) A company is choosing an outside firm to provide its payroll services. It has chosen four comparative categories of interest: client reviews, financial condition, IT capabilities, and government stability. These categories have been assigned weights of 20%, 10%, 40%, and 30%, respectively. Three potential providers were scored on each of those factors (see table below) using a scale of 1-10, with a score of 1 meaning worst possible and 10 meaning best possible. Using the factor-rating method, which provider should be chosen?

	Provider A	Provider B	Provider C
Client reviews	2	6	10
Financial condition	8	4	2
IT capabilities	5	8	2
Government stability	3	1	2

(8 marks)

(Total: 20 marks)

QUESTION 2

(a) A local university is considering changes to its class structure to increase professor productivity. The old schedule had each professor teaching 5 classes per week, with each class meeting an hour per day on Monday, Wednesday, and Friday. Each class contained 20 students. The new schedule has each professor teaching only 3 classes, but each class meets daily (Mon.-Fri.) for an hour. The new classes have 50 students.

i. Calculate the labor productivity for the initial situation (students/hour).
(2 marks)

ii. Calculate the labor productivity for the new schedule (students/hour).
(2 marks)

iii. Suppose that each professor is also required to have 2 hours of office hours on the day they have a class. How does the new schedule increase productivity?
(5 marks)

Continued ...

(b) Bakri is the production manager at a company that manufactures hot water heaters. Bakri needs a demand forecast for the next few years to help decide whether to add new production capacity. The company's sales history (in thousands of units) is shown in the table below. Use exponential smoothing with trend adjustment to forecast demand for period 5. The initial forecast for period 1 was 11 units; the initial estimate of trend was 2. The smoothing constants are $\alpha = .3$ and $\beta = .5$. Write your answer in two decimal places.

Period	Actual
1	12
2	15
3	16
4	18

(11 marks)

(Total: 20 marks)

QUESTION 3

(a) A manufacturing company needs to decide whether to make or buy an accessory item for one of its products. The accessory item's selling price will be \$10 each. If they outsourced the item, there is virtually no cost other than the \$6 per unit they would pay their supplier. Internally, they have two choices. Process A requires an investment of \$120,000 for design and equipment, resulting in a \$4 per unit cost. Process B requires only a \$100,000 investment, but its per-unit cost is \$5. Whether the item is being outsourced or produced internally, there is a 60% chance that they will sell 50,000 units and a 40% chance that they will sell 100,000 units.

i. Draw the decision tree appropriate to the alternatives and outcomes stated.

(6 marks)

ii. Calculate the expected monetary value (EMV) for all courses of action.

(6 marks)

iii. What is their best choice?

(2 marks)

(b) Identify and briefly describe **THREE (3)** sourcing strategies.

(6 marks)

(Total: 20 marks)

Continued ...

QUESTION 4

(a) Ten samples of size four were taken from a process, and their weights were measured. The sample averages and sample ranges are in the following table. Construct and plot x-bar and R-chart using these data. Is the process in control? (Write your answer in the nearest three decimals).

Sample	Mean	Range
1	20.01	0.45
2	19.98	0.67
3	20.25	0.35
4	19.92	0.32
5	20.35	0.36
6	19.23	0.49
7	20.02	0.53
8	19.98	0.40
9	20.56	0.95
10	19.97	0.79

(14 marks)

(b) Identify and describe **THREE (3)** determinants of service quality.

(6 marks)

(Total: 20 marks)

Continued ...

QUESTION 5

(a) Moonlight Manufacturing produces a product for which the annual demand is 10,000 units. Production averages 80 units per day, while demand is 60 units per day. Holding costs are $5.00 per unit per year, and the setup cost is $200.

i. If the firm wishes to produce this product in economical batches, what should be the batch size?

(3 marks)

ii. What is the maximum inventory level?

(2 marks)

iii. How many order cycles are there per year?

(2 marks)

iv. What is the total annual cost?

(3 marks)

(b) Daily demand for a product is normally distributed with a mean of 200 units and a standard deviation of 50 units. The firm currently uses a reorder point system with a lead time of 6 days.

i. What safety stock is appropriate for the firm if it seeks a 90% service level?

(3 marks)

ii. What is the reorder point?

(3 marks)

(c) A bakery uses 7 Kanban containers, each holding 3 cakes. If the safety stock is 5 cakes and the lead time is 2 days, determine daily demand.

(4 marks)

(Total: 20 marks)

Continued ...

RELEVANT EQUATIONS / FORMULAE

1) CL = $\overline{\overline{X}}$ UCL (R) = $D_4 \overline{R}$

UCL, LCL (X – bar) = $\overline{\overline{X}} \pm A_2 \overline{R}$ LCL (R) = $D_3 \overline{R}$

Table for X – bar & R Charts

No of Observation In sub group n	A2	D3	D4
2	1.880	0	3.268
3	1.023	0	2.574
4	0.729	0	2.282
5	0.577	0	2.115
6	0.483	0	2.004

2) UCL c = $\bar{c} + 3\sqrt{\bar{c}}$

LCL c = $\bar{c} - 3\sqrt{\bar{c}}$

3) $\bar{p}$ = Total No of Defective from All Samples/ (No of Samples X Sample Size)

$Sp = \sqrt{\bar{p}(1-\bar{p})/n}$

CL = $\bar{p}$

LCL = $\bar{p} - 3\,Sp$

UCL = $\bar{p} + 3\,Sp$

4)

$$b = \frac{n\sum xy - \sum x \sum y}{n\sum x^2 - \left(\sum x\right)^2} \qquad a = \overline{Y} - b\overline{X}$$

$$\hat{y} = a + bx$$

5) Exponential smoothing

Forecast for the month t: $F_t = F_{t-1} + \alpha\,(A_{t-1} - F_{t-1})$ OR

$F_t = \alpha(A_{t-1}) + (1-\alpha)(F_{t-1})$

6) Exponential smoothing with Trend adjustment

$F_t = \alpha(A_{t-1}) + (1-\alpha)(F_{t-1} + T_{t-1})$

$T_t = \beta(F_t - F_{t-1}) + (1-\beta)(T_{t-1})$

$FIT_t = F_t + T_t$

Continued ...

7) Inventory Management:

$$\text{EOQ} = Q^* = \sqrt{\frac{2DS}{H}} \qquad TC = \frac{Q}{2}H + \frac{D}{Q}S$$

$$\text{EPQ} = Q^*_p = \sqrt{\frac{2DS}{H(1 - d/p)}} \qquad I_{max} = Q\left[1 - \frac{d}{p}\right] \qquad TC = \frac{I_{max}}{2}\text{H} + \frac{\text{D}}{\text{Q}}\text{S}$$

$$SS = z(\sigma_d)\sqrt{LT} \qquad ROP = \bar{d}LT + z\sigma_d\sqrt{LT}$$

8) Lean Operations:

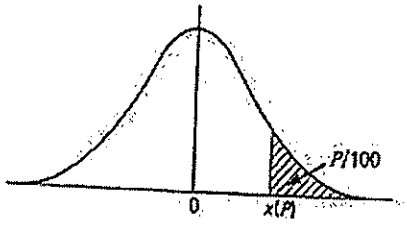
$$N = \frac{\text{Demand during Lead time+ Safety Stock}}{\text{Size of Kanban}}$$

TABLE 5. PERCENTAGE POINTS OF THE NORMAL DISTRIBUTION

This table gives percentage points $x(P)$ defined by the equation

$$\frac{P}{100} = \frac{1}{\sqrt{2\pi}}\int_{x(P)}^{\infty} e^{-\frac{1}{2}t^2}\,dt.$$

If X is a variable, normally distributed with zero mean and unit variance, $P/100$ is the probability that $X \geqslant x(P)$. The lower P per cent points are given by symmetry as $-x(P)$, and the probability that $|X| \geqslant x(P)$ is $2P/100$.



P	x(P)	P	x(P)	P	x(P)	P	x(P)	P	x(P)	P	x(P)
50	0·0000	5·0	1·6449	3·0	1·8808	2·0	2·0537	1·0	2·3263	0·10	3·0902
45	0·1257	4·8	1·6646	2·9	1·8957	1·9	2·0749	0·9	2·3656	0·09	3·1214
40	0·2533	4·6	1·6849	2·8	1·9110	1·8	2·0969	0·8	2·4089	0·08	3·1559
35	0·3853	4·4	1·7060	2·7	1·9268	1·7	2·1201	0·7	2·4573	0·07	3·1947
30	0·5244	4·2	1·7279	2·6	1·9431	1·6	2·1444	0·6	2·5121	0·06	3·2389
25	0·6745	4·0	1·7507	2·5	1·9600	1·5	2·1701	0·5	2·5758	0·05	3·2905
20	0·8416	3·8	1·7744	2·4	1·9774	1·4	2·1973	0·4	2·6521	0·01	3·7190
15	1·0364	3·6	1·7991	2·3	1·9954	1·3	2·2262	0·3	2·7478	0·005	3·8906
10	1·2816	3·4	1·8250	2·2	2·0141	1·2	2·2571	0·2	2·8782	0·001	4·2649
5	1·6449	3·2	1·8522	2·1	2·0335	1·1	2·2904	0·1	3·0902	0·0005	4·4172

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